Flooding

Profiling Hazard Event

The risk assessment shall include an overview of the location of all natural hazards that can affect the State, including information on previous occurrences of hazard events as well as the probability of future hazard events, using maps where appropriate.

Flooding is a temporary overflow of water onto lands not normally inundated by water producing measurable property damage or forcing evacuation of people and vital resources. Floods frequently cause loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss, and interruption of business. Floods also increase the likelihood of hazard such as transportation accidents, contamination of water supplies, and health risk increase after a flooding event.

Several factors determine the severity of floods including rainfall intensity, duration and rapid snowmelt. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can also result in flooding at locations where the soil has been previously saturated or if rain concentrates in an area having, impermeable surfaces such as large parking lots, paved roadways, or post burned areas with hydrophobic soils. Topography and ground cover are also contributing factors for floods. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover.

Frequency of inundation depends on the climate, soil, and channel slope. In regions where substantial precipitation occurs during a particular season or in regions where annual flooding is due to spring melting of winter snow pack, areas at risk may be inundated nearly every year.

Utah, in recent years has seen a new kind of flood risk emerge, that of canal failures and flooding and debris flows related to watersheds damaged by wildfire. This type of flooding is distinctly different from the floods normally dealt with. As Utah continues the move from rural predominantly farmland to urban areas large amounts of land traditionally used for framing is being converted to residential development. This development, occurring in a patchwork fashion, is leaving irrigation canals in place to transport water to undeveloped farms. This is placing residential development near and often below un-engineered irrigation canals. Irrigation canals have a history of breaching, yet development pressure has now put homes at the base of many of these canals.

Post fire related flooding results from enhanced runoff from fire damaged watershed. As fires burn they destroy vegetation and often leave soils in a hydrophobic state, this alters the hydrology of the watershed, producing greater peak flows. It takes the human built environment to turn a natural event into a natural disaster. Development on the foothill all along the Wasatch Front is occurring, at rapid rates. Foothill property is considered prime real estate and is more often than not in URWIN areas on step slopes. This serious problem of debris flows and the elevated risk of debris flow following a wildfire; is discussed further in the landslide section.

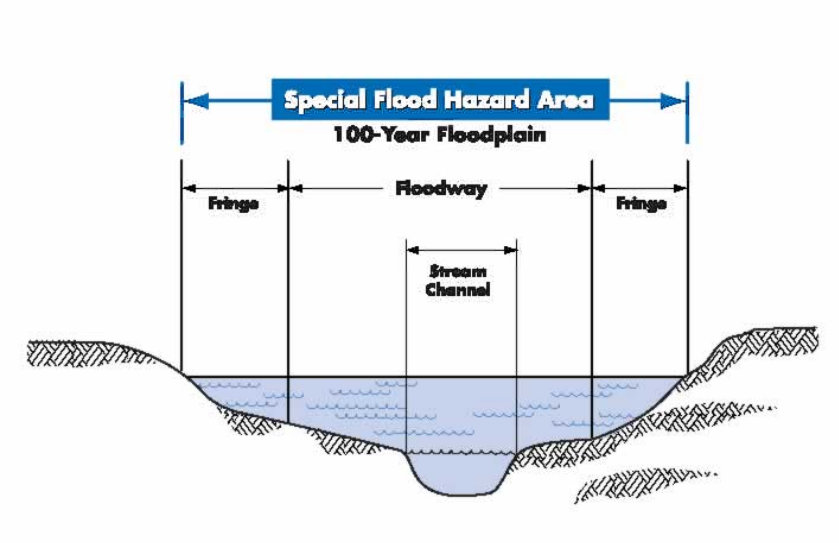
<u>Conditions which my exacerbate floods</u>

Impermeable surfaces
Steeply sloped watersheds
Constrictions
Obstructions
Debris
Contamination
Soil saturation
Velocity

Source: http://www.fema.gov/nfip

Explanation of Common Flood Terms

FIRM: Flood Insurance Rate Map



Fringe:
The portion of the 1-percent-annual-chance (100 year) floodplain that is not within the regulatory floodway and in which development and other forms of encroachment may be permitted under certain circumstances.

Stream Channel:
A naturally or artificially created open conduit that periodically or continuously contains moving water or which form a connecting link between two bodies of water

100-year flood: Applies to an area that has a 1 percent chance, on average, of flooding in any given year. However, a 100-year flood could occur two years in a row, or once every 10 years. The 100-year-flood is also referred to as the base flood.

Base Flood: Is the standard that has been adopted for the NFIP. It is a national standard that represents a compromise between minor floods and the greatest flood likely to occur in a given area and provides a useful benchmark.

Base Flood Elevation (BFE): As shown on the FIRM, is the elevation of the water surface resulting from a flood that has a 1% chance of occurring in any given year. The BFE is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum (NGVD) or 1929, the North American Vertical Datum (NAVD) of 1988, or other datum referenced in the FIS report.

Special Flood Hazard Area (SFHA): Is the shaded area on a FIRM that identifies an area that has a 1% chance of being flooded in any given year (100-year floodplain).

Flood Recurrence	Chance of occurrence in any given year
10 year	10%
50 year	2%
100 year	1%
500 year	0.20%

Floodway: Is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without raising that water surface elevation by more than one foot.

Major Floods in Utah

Major floods are those that are extensive and have large recurrence intervals (greater than 25 years). These major events and additional floods of a more local nature are listed chronologically in Table F-1. Stream flow records from six stream flow-gauging stations depict major floods in Utah. The selected gauging stations are on streams that represent natural runoff in Utah's principal river basins. Data from the gauging stations are collected, stored, and reported by water year (a water year is the 12-month period from October 1 through September 30 and is identified by the calendar year in which it ends).

Major floods in Utah are almost always the result of rapidly melting snow in late spring and early summer, often intensified by accompanying rain. Intense summer thunderstorms have historically caused heavy damage in several localities. .

Many other floods in Utah have been severe locally and have affected considerably smaller areas than the areas of those floods identified in Table I-18. Some of these local floods have caused substantial loss of life and property damage.

Table I-18 Chronology of major and other memorable floods in Utah, 1884-2010

Flood	Date	Area Affected	Recurrence Interval (in years)	Remarks
Flood	July 4, 1884	Colorado River	>100	Probably snowmelt combined with rainfall
Flood	Aug. 13, 1923	Tributaries to Great Salt Lake between Ogden and Salt Lake City.	Unknown	Locally intense thunderstorms. Deaths, 7; damage, $3,000,000
Flood	Apr. 28-June 11, 1952	Strawberry, upper Price, upper San Rafael, Ogden, Weber, Provo, and Jordan Rivers; Blacksmith Fork, and Spanish Fork; upper Muddy and Chalk Creeks.	25 to >100	Melting of snowpack having maximum-of-record water content for Apr. 1. Disaster declared. Deaths, 2; damage, $8.4 million.
Flood	June 16, 1963	Duchesne River	>100	Dam failure
Flood	June 10-11, 1965	Ashley Creek and other streams between Manila and Vernal and west of Manila.	>100	Three days of intense rainfall on thick snowpack above altitude 9,200 feet. Deaths, 7; damage, $814,000.
Flood	Dec. 6- 7, 1966	Virgin and Santa Clara Rivers.	25 to >100	Four days of light to intense rainfall of as much as 12 inches. Damage, $1.4 million.
Flood	Aug. 1- 2, 1968	Cottonwood Wash and other nearby tributaries to	50 to >100	Locally intense thunderstorms following 11 days of rainfall.

		San Juan River.		Damage, $34,000.
Flood	Sept. 5- 7, 1970	San Juan River and tributaries from McElmo Creek to Chinle Creek.	25 to >100	Record breaking rainfall. Deaths, 2; damage, $700,000.
Flood	Aug. 27, 1972	Vernon Creek	>100	Locally intense thunderstorms.
Flood	Apr. 10-June 25, 1983	Lower Duchesne and Jordan Rivers and tributaries (including Spanish Fork); upper Price, Bear, Sevier, and San Pitch Rivers; Chalk, East Canyon, Trout, and George Creeks; Great Salt Lake and tributaries between Ogden and Salt Lake City.	25 to >100	On April 10, a landslide caused by precipitation dammed the Spanish Fork, which then inundated the community of Thistle. The landslide was the most costly geologic phenomenon in Utah's history. Affected 22 counties. Rapid melting of snowpack having maximum-of-record water content for June 1. Disaster declared by President. Damage, $621 million.
Flood	Apr. 17-June 20, 1984	White, upper Price, and Fremont Rivers; lower Bear and Sevier Rivers and tributaries; Beaver River; Red Butte Creek; Spanish Fork; Jordan River.	25 to >100	Runoff from greater than average snowpack for Apr. 1 and spring precipitation. Deaths, 1; damage, $41 million.
Flood	May 22, 1984	Sevier Lake	Unknown	Runoff in Sevier River from Nov. 1982 through June 1984 exceeded upstream reservoir capacity; about 1.5 million acre-feet of water conveyed to Sevier Lake. On May 22, 1984 lake reported to be as much as 35 feet deep after being nearly dry since about 1880.
Flood	June 15, 1984	Utah Lake	Unknown	Runoff from greater than normal precipitation since Sept. 1982 increased lake level to 101-year record of 5.46 feet above compromise level on June 15, 1984. Damage, $5.9 million.
Flood	June 3, 1986	Great Salt Lake	Unknown	Large runoff from greater than normal precipitation since Sept. 1982 increased lake level to 140-year record elevation of 4,211.85 feet on June 3, 1986. Damage, $268 million.
Flood	January 8-12, 2005	Santa Clara and Virgin Rivers, Red Cliff Recreation Area	Unknown	A rain on snow event resulting from a stalled storm system brought abundant precipitation throughout the state. Damage estimates are estimated at $300 million dollars. In addition, 30

				homes destroyed and 20 significantly damaged. Presidential Disaster Declaration declared February 1, 2005.
Flood	April 28, 2005 – June 29, 2005.	Lower Bear River Basin, Duchesne and Sevier basins	>100	Heavy and frequent localized precipitation events from April 28, 2005 until June 29, 2005, resulted in an estimated $2.9 million dollars in damages to public and private properties, roads, and bridges. A Presidential Disaster Declaration was declared August 1, 2005 and included Beaver, Box Elder, Kane, Sevier, Tooele, Uintah, and Wasatch counties as well as the Uintah and Ouray Indian Reservations.
Flood	June 2010	Salt Lake County, Summit County, Piute County, Uintah County, and the Unitah and Ouray Indian Reservation	Unknown	Water and debris flow from springtime snowmelt and precipitation caused an estimated $916,868 in damages to public and private property in multiple jurisdictions throughout the sate.

FLOODS

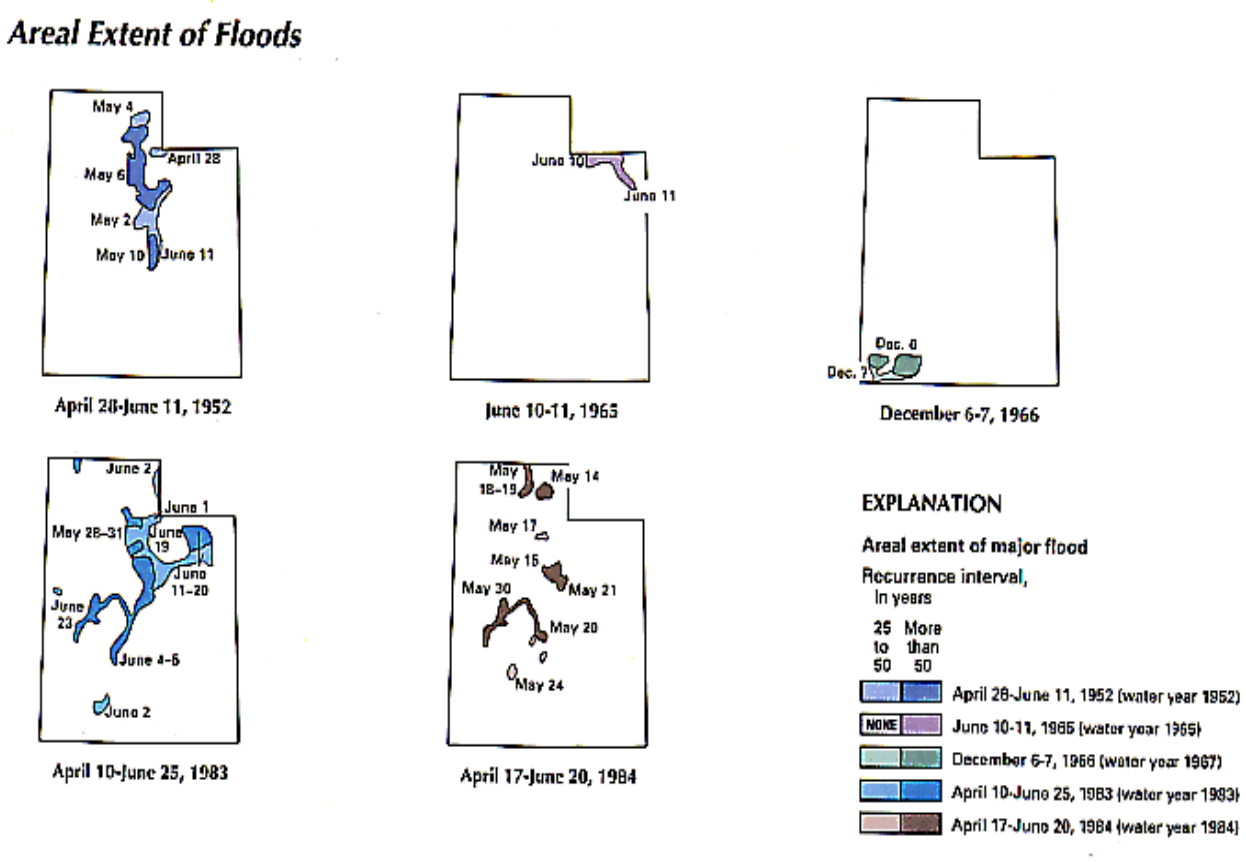


Figure I-22. Aerial Extent of Floods in Utah.

The six major floods of record occurred in 1952,1965, 1966, 1983, 1984, 2005. The aerial extent and severity of these floods are determined from six gauging stations.

The April 28, 1952, flooding on Chalk Creek at Coalville and other flooding during the extensive April 28-June 11, 1952, floods were caused by melting, of maximum-of-record snowpack for April 1 (U.S. Soil Conservation Service, 1983). Flooding was severe in central and north-central Utah (figure I-10), and a flood disaster was declared. Two lives were lost in boating accidents on the swollen Ogden River (Wells, 1957, p. 597-613). Flood damage was $8.4 million, of which $1.9 million was in Salt Lake City.

Rainfall on melting snowpack caused the June 11,1965, flood on Ashley Creek near Vernal and the June 10-11, 1965, floods in northeastern Utah. Flooding also was severe on several other streams in the Uinta Mountains near Vernal and Manila. Areas at altitudes above 9,200 feet contributed most to the flooding. During the flood, the snowline receded from about 9,200 to 9.900 feet. Peak discharges were greater than the

discharge expected to recur once in 100 years on Ashley Creek on the southern slope of the Uinta Mountains and on streams on the northern slope. On a creek southwest of Manila, floodwaters that were the most severe in 40 years swept away and killed seven campers during the night. Within the storm area, flooding caused estimated damage of $814,000 to roads, bridges, irrigation canals, fences, and crops. (Rostvedt and others, 1970, p. E54-E57).

December 6, 1966 (water year 1967), a flood on the Santa Clara River near Pine Valley occurred. A rainstorm during December 3-6 was of unprecedented aerial coverage and intensity for extreme southwestern Utah. Rainfall in the storm area ranged from about 1 to 12 inches. Peak discharges on the Virgin and Santa Clara Rivers and other streams in the storm area had recurrence intervals that exceeded 100 years. Aerial extent of the flooding is shown in Figure F-1. Total damage to crops, fences, roads, bridges, diversion structures, cropland, forestlands, and improvements was about $ 1.4 million (Butler and Mundorff, 1970, p. A-l9).

The floods of April 10-June 25, 1983, affected 22 counties, or more than three-fourths of the State. On April 10, a landslide caused by precipitation dammed the Spanish Fork, which then inundated the community of Thistle. The landslide, which resulted in damage of about $200 million and a Presidential disaster declaration, was the most costly geologic phenomenon in Utah's history (Utah Division of Comprehensive Emergency Management, 1985, p. 40).

Rapid melting of snowpack that had maximum-of-record water content for June 1 (U.S. Soil Conservation Service. 1983) resulted in the largest and most widespread flooding in the State’s history; peak discharges had recurrence intervals that exceeded 100 years on several streams. New discharge records were set on many others, such as Chalk Creek at Coalville. On June 23, the Delta-Melville-Abraham-Deseret Dam on the Sevier River near Delta failed because of the flooding on June 23, 1983, and released 16,000 acre-feet of water down the river. Two bridges were washed away, and the town of Deseret was inundated by as much as 5 feet of water (Utah Division of Comprehensive Emergency Management, 1985, p. 41).

Overall damage from the April 10- June 25, 1983, floods totaled $621 million (Stephens, 1984, p. 20-36). No deaths were attributed to the floods.

The May 24, 1984, flood on the Beaver River near Beaver and other flooding during the April 17- June 20,1984, floods caused damage second in magnitude only to damage in 1983. The major cause of the flooding was much greater than average snowpack and greater than normal precipitation that continued throughout the spring. Peak discharges exceeded those in 1983 at some sites on the White, Bear, Jordan, and Beaver Rivers. Owing to severe flooding in 12 counties, a disaster was declared by the President. On May 14, rainfall caused a mudslide near the coal-mining town of Clearcreek that killed one person and injured another. The direct impact on people was considerably less in 1984 compared to 1983 because of mitigation measures implemented during the previous

year. Total damage for floods and landslides was estimated to be $41 million (Utah Division of Comprehensive Emergency Management, 1985, p. 15).

Floods not only can cause direct loss of life and property, but also can adversely affect the use and quality of surface water, resulting in economic and environmental costs that are not apparent until the floodwaters recede. For example, floods transport large quantities of sediment and debris from eroding channels, and then deposit the material on cropland and streets and in homes, reservoirs, and stock ponds. In addition, waterfowl nesting can be disrupted when areas adjacent to lakes become flooded.

A stalled storm-system containing abundant moisture caused significant flooding in Washington and Kane Counties in Southern Utah between January 8-12, 2005. The storm brought rain and snow throughout much of the state causing additional precipitation to accumulate in areas already containing deep snow pack. Higher snowfall and water equivalent totals equaled 70" at Cedar Breaks, 60" at Kolob-Zion Park, and 58" at Alta. It is estimated that $300 million dollars in damages was sustained along the Santa Clara and Virgin Rivers in Washington County. 30 homes were destroyed in the flood and another 20 homes were significantly damaged (NCDC, 2005). One fatality associated with this event resulted when a man and his wife in their vehicle were caught in floodwaters in the Red Cliff Recreation Area near the Quail Creek Reservoir. Six other injuries were reported. Two additional fatalities resulted from avalanches that occurred after the storm. The avalanches occurred primarily due to the considerable amount of wet, heavy snow that fell in the higher mountain elevations during these storms (UtahWeather.org). A Presidential Disaster Declaration was declared February 1, 2005.

Derived from Major floods in Utah is excerpted from Paulson, R.W., Chase, E.B., Roberts, R.S., and Moody, D.W., Compilers, **National Water Summary 1988-89-- Hydrologic Events and Floods and Droughts:** *U.S. Geological Survey Water-Supply Paper 2375, 591 p.*

Assessing Vulnerability by Jurisdiction

> [The risk assessment shall include] an overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments... The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events…

Assessing the states vulnerability to flooding in a quantitative matter proved quite problematic. Utah has limited mapped flood plains and with the exception of Salt Lake and Utah Counties floodplain maps have not yet been digitized. Using NFIP statistics provided limited utility in determining flood vulnerability. Much of Utah's flood risk is either not mapped, mapped as Zone D Indicating the flood risk is undetermined, the city or county does not participate in the NFIP, or because people in the state perceive there is not flood risk and do not believe there is a need to purchase flood insurance.

NFIP Flood Insurance Statistics for Utah (1/1/78-9/18/07)	
Policies in-force	4,240
Insurance in-force	$923,092,900
Premiums in-force	$2,583,496
Total losses	814
Total payments	$5,484,374

Figure I-23 NIFP Statistics

Therefore, much of Utah's flood loss goes unreported. Evidence of this can be seen in figure I-23. In almost 25 years, the National Flood Insurance Program as paid out just over $5 million dollars on 783claims.

To determined flood vulnerability for each jurisdiction, the state's floodplain experts were assembled to provide a qualitative vulnerability assessment, classifying each county into a high, medium, or low flood vulnerability rating. Experts included the State Flood Plain Manager, State Hazard Mitigation Officer, the U.S. Army Corps of Engineers, and members of the State Hazard Mitigation Team. Classifications were based on population, in-place flood mitigation, age and accuracy of NFIP maps, dollar amounts of infrastructure values from HAZUS MH, past flood loss, and the potential for future flooding as a result of development pressure. Counties classified as having a Low hazard rating can still and often do experience flooding. This flooding is most often localized doing significant damage to a small number of structures.

High
Salt Lake
Davis
Utah
Summit
Weber
Tooele
Washington

Medium
Box Elder
Cache
Morgan
Wasatch
Uintah
Sanpete
Carbon
Sevier
Grand
Iron

Low
Rich
Daggett
Duchesne
Juab
Millard
Emery
Beaver
Piute
Wayne
Garfield
San Juan
Kane

Limited digital data combined with NFIP statistics, which do not adequately represent the true flood vulnerability of Utah, should not be used to underscore the flood risk in Utah. Flooding in Utah is typically localized and just under the threshold of a major disaster. For example on September 12, 2002 intense rainfall triggered multiple debris flows on Dry Mountain in Utah County. These debris flows did significant damage to the City of Santaquin and the unincorporated area of Spring Lake. There was one NFIP policy in the subdivision and fifty homes were affected. On September 9, 2003, San Juan County was rocked by fall rainstorms, which caused flooding along the San Juan River and its tributaries, causing approximately $2 million dollars in damage. Flooding caused basement damage in the spring of 2004 in Weber County when an undersized storm water ditch overflowed its banks. On April 6, 2004 heavy rains caused damage to homes along the Compton Bench areas of Farmington City. These are only some of the events, which occurred over the last two years.

Utah floods are not typical the large multi-day events seen in the Midwest or along the east coast, floods are typically localized events running out of mountain or desert canyons. Individuals feel the pain of flood loss regardless of location, those damaged by flood loss in Utah suffered equal to those flooded along the Mississippi during the 1990's. Past damage shows if FEMA used a cumulative threshold to determined the need for a Presidential declaration chances are Utah would receive one every year, not every ten as the statistics indicate

In the past Utah has received four Presidential declarations for flooding: in 1983, 1984 and two in 2005. Following the events of 1983-84 an enormous amount of mitigation was installed along the urban areas of the Wasatch Front, which experienced flooding. As an example, Salt Lake County started a county flood control project and pumps were installed on the Great Salt Lake. Today Utah utilizes an advanced water-monitoring network of stream gauges, SNOTEL sites, and automated stream flow gates.

Estimating Potential Losses by Jurisdiction

[The risk assessment shall include an] overview and analysis of potential losses to identified vulnerable structures, based on estimates provided in local risk assessments…

Due to the lack of digital floodplain maps it was virtually impossible to conducted a vulnerability analysis, which produced losses by jurisdiction based on dollars amounts of at risk infrastructure. This is something the state desperately wants to correct, and will as floodplain maps are digitized through the Floodplain Map Modernization Program, and as GIS loss estimation tools such as HAZUS MH become more advanced. At this time only two Utah counties have digitized flood plain maps Salt Lake County and Utah County, estimated losses for these counties are listed in Table I-15 and I-16. Understanding dollar losses is vital to performing cost effective mitigation further supporting Utah's number one flood related mitigation goal of modernizing the inventory of floodplain maps.

This plan incorporates and advocates the State "Map Modernization Program Business Case Plan" and the State "Map Modernization Prioritization Plan" as a solution to the abundant problems with the NFIP maps. Together these plan layout an achievable plan to modernize floodplain maps within the state of Utah. The need for updated floodplain maps was the number one issue being, consistently raised by locals throughout the PDM planning process and continues to be the top priority of the State Floodplain Management Program. This ties directly into Utah's inability to estimate flood losses by jurisdiction, because of lack of accurate digital flood maps.

Table I-19 Salt Lake County Estimated 100-Year Flood Plain Losses

City Name	City Area (Acres)	Acres in 100 Year Flood Plain	Number of Structures within 100 Year Floodplain		Population in Hazard Area
			Residential / Replacement Value	Commercial/ Annual Sales	
Alta	2,623	3	0	0	0
Bluffdale	10,543	179	11 / $5,628,290	1 / $100,000	35
Draper	14,187	293	172 / $48,378,260	38 / $22,400,000	550
Herriman	7,744	204	71 / $14,128,210	1 / $300,000	227
Holladay	3,235	43	19 / $14,681,820	25 / $9,600,000	61
Midvale	3,840	32	8 / $654,400	18 / $32,400,000	26
Murray	6,690	170	196 / $30,533,950	61 / $56,100,000	568
Riverton	8,044	361	210 / $43,393,200	11 / $7,400,000	609
Salt Lake City	70,938	2,975	459 / $66,013,850	353 / $941,800,000	1,331
Sandy	14,367	201	141 / $37,322,340	15 / $11,600,000	409
South Jordan	14,150	786	378 / $99,249,270	25 / $11,800,000	1,096
South Salt Lake	4,409	281	165 / $18,299,500	84 / $187,400,000	528
Taylorsville	6,963	141	93 / $22,173,160	2 / $900,000	307
West Jordan	20,448	717	287 / $77,460,590	96 / $153,200,000	947
West Valley	22,808	715	335 / $49,542,360	85 / $588,100,000	1,106
Un-Incorporated	304,953	56,806	861 / $234,634,650	92 / $159,100,000	2,238

Courtesy of WFRC

Table I-20 Utah County Estimated 100-Year Flood Plain Losses

City	County	Population	Households	Value	Employment
Alpine	Utah	2,970	693	$103,950,000	24
American Fork	Utah	1,407	354	$53,100,000	58
Cedar Hills	Utah	0	0	$0	
Genola	Utah	62	17	$2,550,000	
Highland	Utah	1,042	245	$36,750,000	
Lehi	Utah	3,020	821	$123,150,000	166
Lindon	Utah	1,737	398	$59,700,000	338
Mapleton	Utah	469	115	$17,250,000	
Orem	Utah	633	170	$25,500,000	473
Payson	Utah	1,649	441	$66,150,000	191
Pleasant Grove	Utah	173	40	$6,000,000	
Provo	Utah	8,438	2,409	$361,350,000	1388
Salem	Utah	604	186	$27,900,000	7
Saratoga Springs	Utah	451	123	$18,450,000	
Spanish Fork	Utah	1,157	298	$44,700,000	87
Springville	Utah	834	233	$34,950,000	51
Utah	Utah	1,795	492	$73,800,000	
Vineyard	Utah	48	16	$2,400,000	

Courtesy of Mountainlands AOG

Assessing Vulnerability by State Facilities

[The risk assessment shall include an] overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in …the State risk assessment. …State owned critical or operated facilities located in the identified hazard areas shall also be addressed…

As stated above, without digital floodplain maps it is cost prohibitive to determine which flood zone if any Utah's 5,000 plus state owned facilities are located in. A floodplain study initiated by the State Department of Facilities and Management found no critical facilities owned by the state in the 100-year flood plain. In future versions of the State Hazard Mitigation Plan, it is anticipated the state will utilize digitized floodplain maps to determine and exact dollar loss amount vulnerable to flooding for each state owned facility. However, until maps, are brought into the spatial realm of GIS it will continue to be capital intensive in terms of both financial and human to grasp both the number and dollar value of those buildings in the flood plain.

Estimating Potential Losses by State Facilities

[The risk assessment shall include the following:]…[a]n overview and analysis of potential losses to identified vulnerable structures, based on estimates provided in …the State risk assessment. The State shall estimate the potential dollar losses to State-owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.

In order to estimated the potential loss Utah could face due to state owned facilities in a flood zone. To have a complete analysis the state needs a database of state owned facilities, which have been assigned a spatial location and digital flood plain maps. Utah currently has neither of these. Through the Flood Map Modernization Program Utah will be receiving digital flood plain maps. To accompany these new maps Utah will digitize the state owned facilities data set, together this will supply Utah with an accurate picture of which state owned facilities are in the flood plain and allow an estimate of potential loss. As maps are completed under the Map Modernization Program they will be incorporated in to future revisions to this mitigation plan.

Comparison of Flood and Flash Flood Deaths in Utah prior to 1950 and Flash Flood Death in Utah After 1950.

Table I-21

July 17, 1863	4	Iron	A flood generated by a series of cloudbursts raised Pine Creek to a level of 20 feet. A house was swept away and four children drowned.
July 23, 1878	2	Tooele	A cloudburst at Johnson's settlement in Skull Valley resulted in a flood which killed two Indians and 20 head of cattle.
August 16, 1889	1	Sanpete	A flash flood drowned a boy, some cattle, and some horses in Wood Canyon near Mayfield.
July 14, 1896	2	Juab	Torrential rain flooded the town of Eureka. Two people were drowned and one died of heart failure.
July 28, 1896	4	Juab	Four people lost their lives in Eureka. Main Street was turned into a raging torrent.
August 22, 1896	1	Sevier	A wagonload of laborers was caught in a flooded stream in Clear Creek Canyon, south of Joseph. One man was killed.
October 7, 1896	1	Grand	A man drowned while attempting to cross Mill Creek near Moab while it was swollen by heavy rain.
August 4, 1900	1	Emery	In Orangeville, a boy drowned in a creek flooded by heavy rain.
August 5, 1901	1	Garfield	A boy drowned while swimming in the gorge 15 miles below Escalante when a freshet came down the gully.
August 6, 1901	2	Carbon	Two lives were lost and a great deal of damage was done to property at Winter Quarters, which is west of Scofield.
August 10, 1903	1	Washington	A man was trapped in a flash flood in Dry Creek near Toquerville. He subsequently drowned.
September 1, 1909	1	Uintah	A man drowned in a flash flood while driving a wagon across a stream. Occurred at the Ashley River near Vernal.
June 19, 1918	1	Sanpete	An intense cloudburst caused extensive flooding along Pleasant Creek in Mount Pleasant. One farmer drowned, and property damage amounted to $100,000. Streets were covered with mud, boulders, and debris.
August 2, 1922	1	Salt Lake	Ellis Yates, a 6 year old boy, was drowned by a flood in Magna. The flood demolished his family's residence.
August 13, 1923	7	Davis	Seven people drowned as a result of a tremendous flood in Farmington Canyon near Farmington. Farming sections were largely destroyed, with houses, barns, orchards, and highways covered with several feet of mud. Lagoon resort was flooded and patrons were

			rescued from trees. Farmington Canyon Road was completely destroyed.
August 13, 1923	2	Box Elder	Two women drowned when their house was demolished by a flash flood in Willard Canyon near Willard.
July 4, 1925	1	Uintah	An eight-year-old child drowned as he was swept from an automobile by a flood in Five Mile Creek near Vernal.
August 16, 1928	1	Carbon	A sheep rancher drowned when torrential rains at Nine Mile Canyon near Price caused heavy flooding that covered his automobile. His daughter, who was riding with him, escaped by clinging to brush and crawling to safety.
July 21, 1934	1	Sevier	A boy drowned in a sudden flood in Lost Creek near Salina.
July 29, 1936	1	Emery	A woman drowned in a flood in Ferron which swept down a dry wash following a cloudburst.
July 30, 1936	1	Beaver	Cloudburst rains caused heavy damage to property in Minersville. One woman drowned.
July 29, 1937	1	Carbon	Huge boulders were loosened by a flood in Price, rolling through a house and killing a 6-year-old girl. Three other people were injured.
August 31, 1939	1	Grand	Mrs. Albert Turner was swept to her death at the head of Diamond Creek in the Book Cliffs near Cisco by flood waters.
August 5, 1948	1	Carbon	The body of a man was found in a pile of debris after a flash flood near Sunnyside.
TOTAL DEATHS BEFORE 1950	**40**		
August 26, 1952	1	Emery	One man drowned when a cloudburst flooded the tunnel in which he was working at Buckhorn Wash Proving Ground about 15 miles south of Castle Dale.
September 17, 1961	5	Washington	A hiking party of 26 persons was caught in a flash flood in a narrow canyon (termed the Narrows) of the Virgin River in Zion National Park. Five members of that party drowned (scouts). The flood resulted from heavy rainfall and was said by old-timers to be the largest they had ever seen coming through the Narrows. The crest of the flood reached 14 feet in some of the narrow gorges.
September 17, 1961	1	Kane	At Wahweap Creek near Glen Canyon City a 9-year-old girl drowned in a flash flood.
June 10, 1965	7	Daggett	A husband...wife...their three children...and two nephews drowned in a flash flood in Sheep Creek Canyon in the Uinta Mountains. They were camped in Palisades Campground along the snowmelt-swollen waters of Sheep Creek. Heavy rains in the area turned the creek into a raging torrent.
September 5, 1970	2	San Juan	A major Labor Day storm in the Four Corners area of Utah (also Arizona) produced tremendous amounts of rain. A couple drove their car off a washed-out bridge and drowned but their son...who was washed into shallow water...survived. A great deal of damage was done to property in the area such as roads and ranches.
February 18, 1980	1	Washington	Flooding was extensive due to heavy rains along the Virgin and Santa Clara Rivers in southwest Utah. A woman and her companion attempted to cross swollen Kolob Creek near Virgin. The vehicle they were riding in was carried several hundred yards downstream with the woman drowning and her companion swimming to safety.
June 24, 1983	1	Millard	The DMAD dam near Delta failed on June 23rd, creating a flash flood. A man tried to traverse the raging waters

			from the demise of the dam...fell in...and drowned.
May 13, 1984	1	Carbon	A man was killed by a debris/mud flow in the tiny town of Clear Creek. Also...three homes and four garages were demolished.
May 14, 1984	1	Tooele	A man was killed in Middle Fork Canyon at the Carr Fork Mine when a mudslide released tons of debris/mud that covered his bulldozer.
February 18, 1986	1	Box Elder	Heavy rains in Box Elder County caused flooding in several areas. A 2-year-old boy drowned in a rain-swollen canal/irrigation ditch.
September 14, 1996	1	San Juan	A flash flood in the afternoon claimed the life of a 16-year-old girl. She and 12 others (adults/teens) were hiking in the "Black Hole" area of White Canyon (38 miles west of Blanding) when the flash flood roared through the narrow canyon. She was swept away with her body being found about 100 yards downstream the next day.
July 27, 1998	2	Washington	Two male hikers drowned in the Zion "Narrows" during a flash flood. One was 27 years old and the other 31 years old.
September 5, 1998	1	Kane	A flash flood in Glen Canyon National Recreation Area's Ice Cream Canyon swept away and drowned a 10-year-old girl. She was standing on the side of the canyon observing the flash flood in the canyon below when the side gave way and she fell in.
May 13, 2001	1	Washington	A 10-year-old boy was killed after being swept off a cliff by a "curtain" of water during a flash flood that was falling across a steep cliff-side trail. A second boy was rescued.
January 10, 2005	1	Washington	A man and his wife in their vehicle got caught in flood waters in a normally dry wash in the Red Cliff Recreation area near Quail Creek Reservoir during a major flood event. The man was swept downstream and was killed, while the woman was rescued.
TOTAL DEATHS SINCE 1950	**27**		
TOTAL DEATHS	**67**		